ML501 Overview and Setup

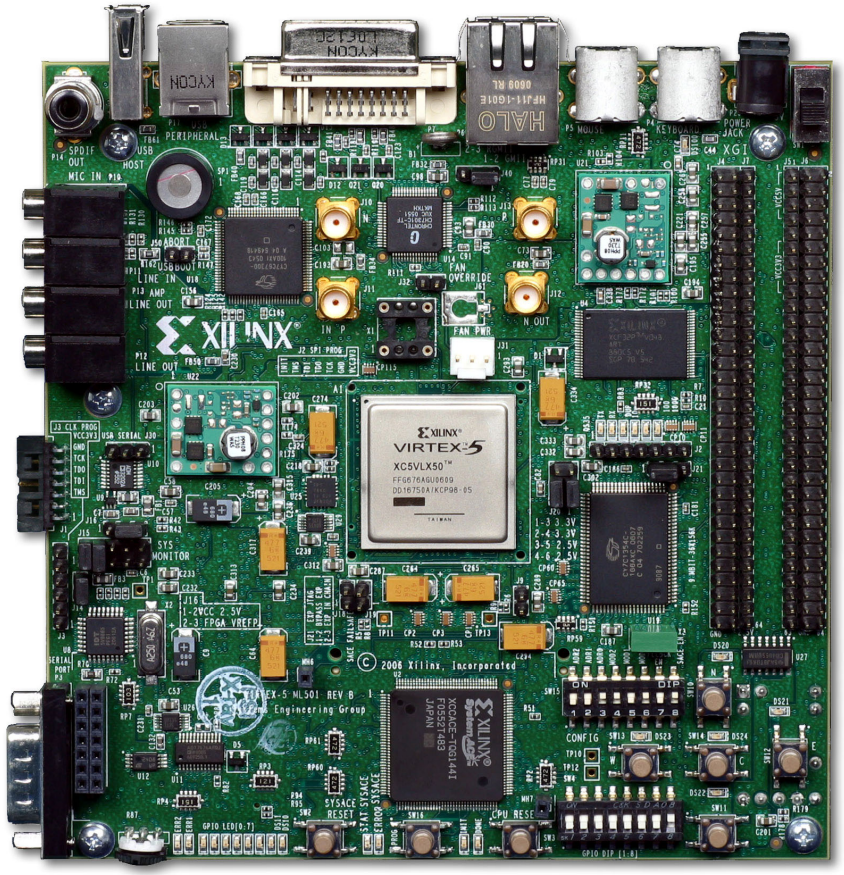
Overview of the Hardware Designs and Software Applications
How to set up the equipment, software, CompactFlash, network, and terminal programs

May 2008

© 2007 Xilinx, Inc. All Rights Reserved

ML501 Overview

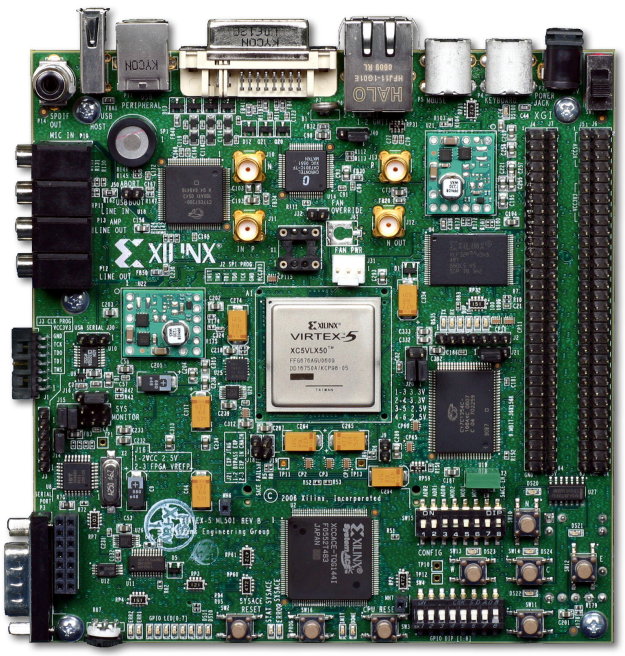
- ML501 Overview
- Equipment Overview
- Equipment Setup
- Software Setup
- CompactFlash Setup
- Network Setup
- Appendix



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

ML501 Overview

- The ML501 embedded development platform provides several reference designs and a versatile hardware platform for rapid prototyping and system verification

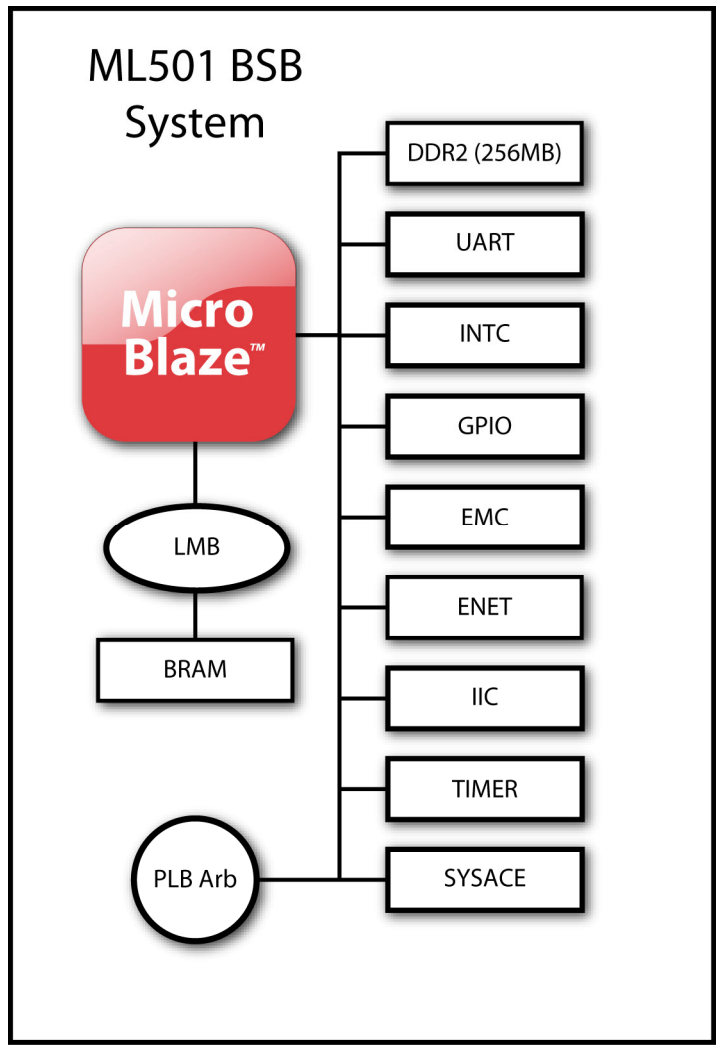


- Hardware Designs
  - ml501_bsb_design
  - ml501_bsb_std_ip
  - ml501_bsb_std_ip_usb
  - ml501_std_ip_pcores
- Software Applications
  - Standalone non-OS applications

© 2007 Xilinx, Inc. All Rights Reserved

ML501 BSB Hardware

- The ML501 MicroBlaze design hardware includes:
  - DDR2 Interface (256 MB)
  - BRAM
  - External Memory Controller (EMC)
    - **ZBT SRAM**
  - Networking
  - UART
  - Interrupt Controller
  - System ACE CF Interface
  - GPIO (IIC, LEDs and LCD)
  - PLB Arbiter

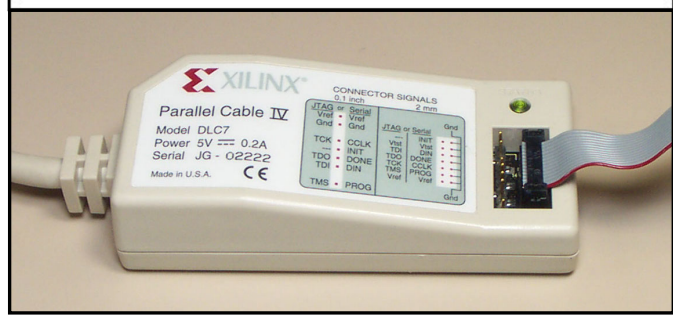


Note: Presentation applies to the ML501

© 2007 Xilinx, Inc. All Rights Reserved

Also Available From Xilinx

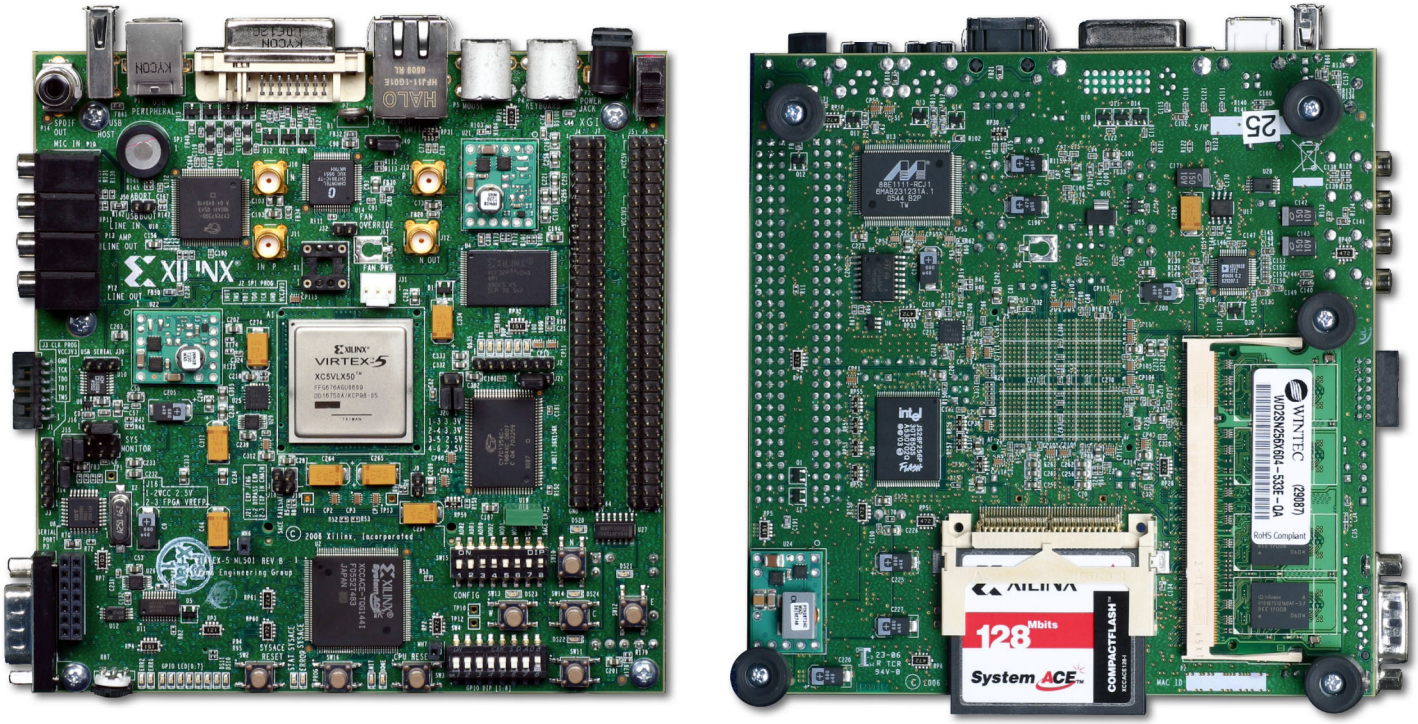
- These items are *not* included with the ML501, but are available for purchase from Xilinx:
  - Xilinx Integrated Software Environment (ISE)
  - Xilinx Platform Studio (XPS)
  - Parallel Cable IV (PC4) JTAG cable
- These items are required to run the ML501 presentations



© 2007 Xilinx, Inc. All Rights Reserved

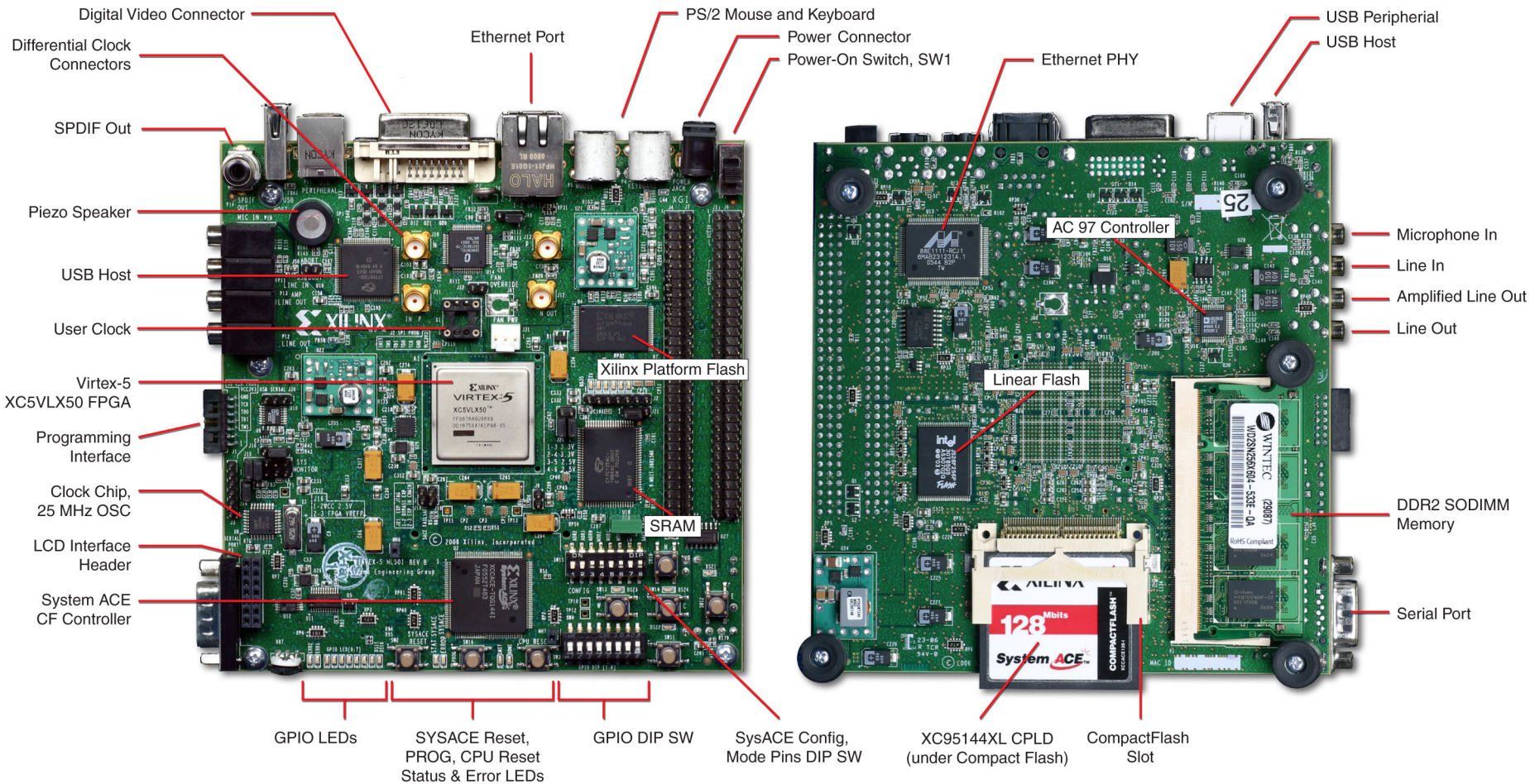
ML501Details

- The ML501 Board
  - Zoom in for a better view (up to 400%)
- Features the Xilinx Virtex™-5 XC5VLX50 FPGA



© 2007 Xilinx, Inc. All Rights Reserved

ML501Details



© 2007 Xilinx, Inc. All Rights Reserved

Equipment Overview

- SiliconDrive™ 32 MB CompactFlash™
  - Comes preloaded with hardware and software demonstration systems for ML501

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Equipment Overview

- SanDisk ImageMate™ (optional)
  - Provides a USB interface for programming CompactFlash cards
  - See www.sandisk.com for more information

- SanDisk PC Card adapter (optional)
  - Used in a laptop PCMCIA slot to program CompactFlash cards

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Equipment Overview

- DVI monitor

  or

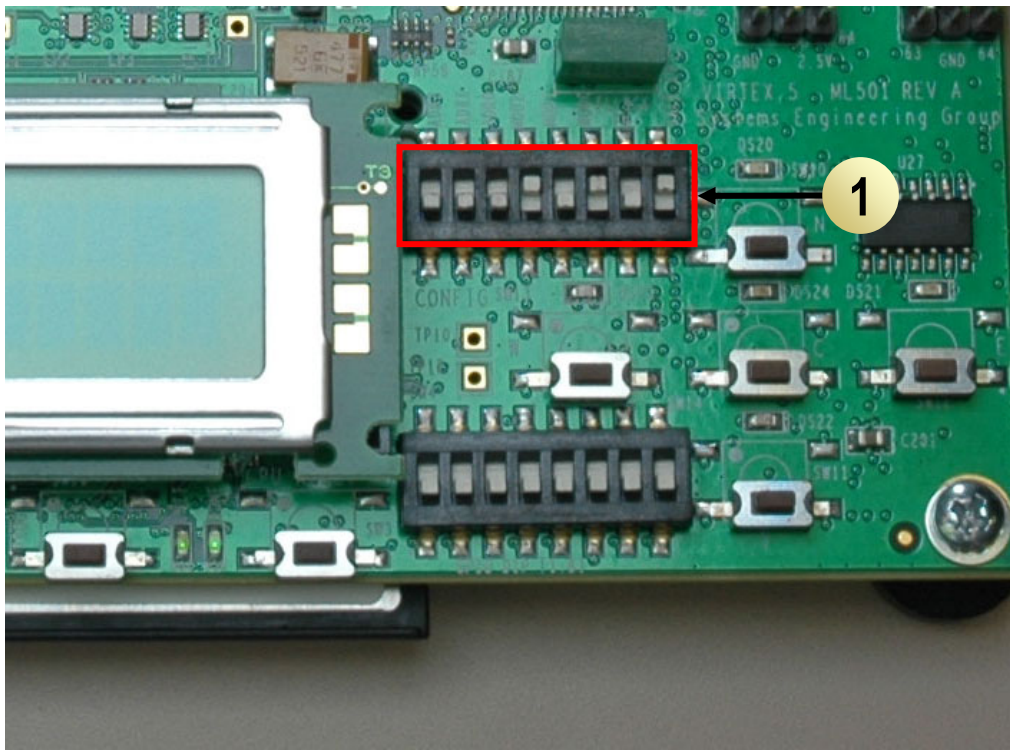
- DVI to VGA adapter
  - To connect from the ML501 DVI port to a standard VGA monitor
  - http://www.belkin.com

- Pancake Fan (optional)
  - Recommended for cooling the Virtex-5 device on the ML501 board

© 2007 Xilinx, Inc. All Rights Reserved

Equipment Setup

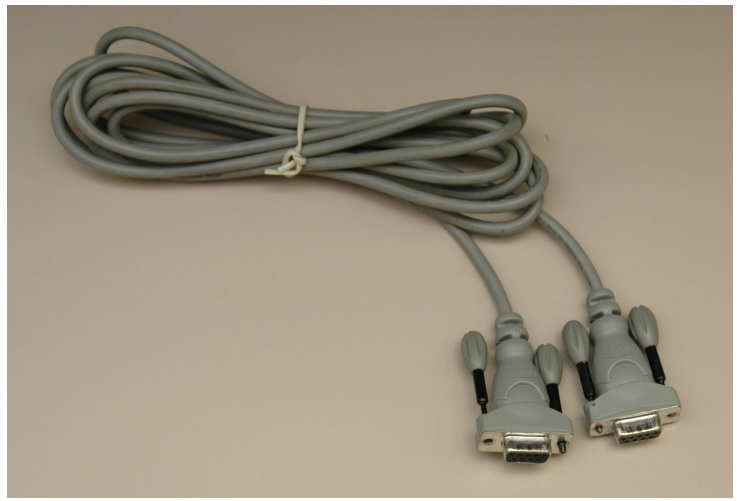
- Set Front DIP Switches to 00010101 (1)



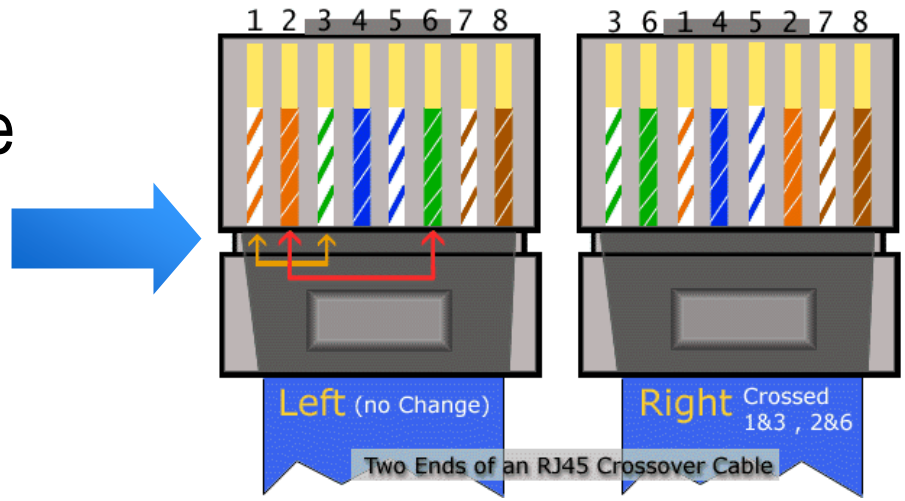
© 2007 Xilinx, Inc. All Rights Reserved

Equipment Overview

- User supplied – null modem serial cable



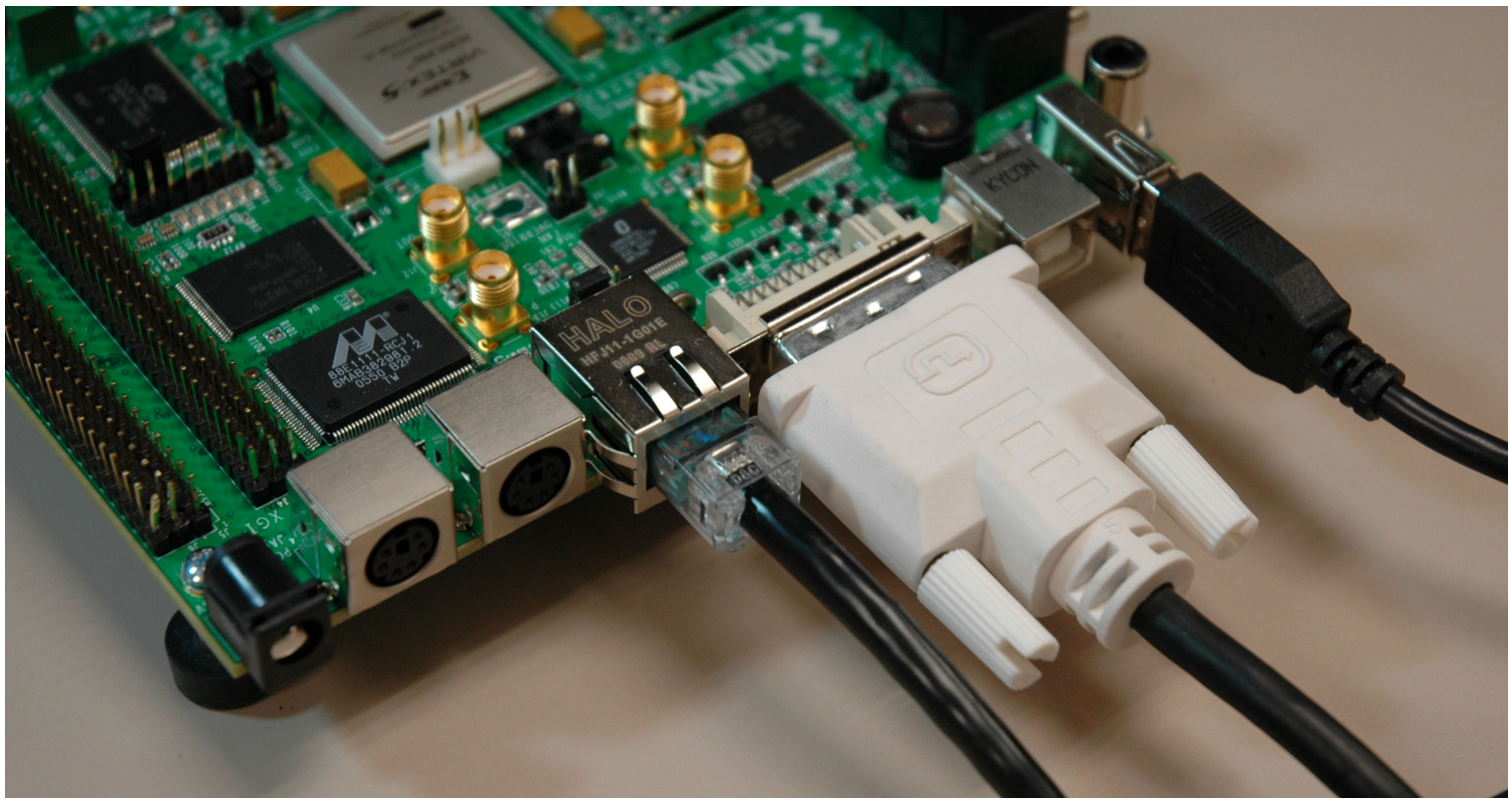
- Ethernet cross-over cable
  - Similar to a null-modem for Ethernet



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Equipment Setup

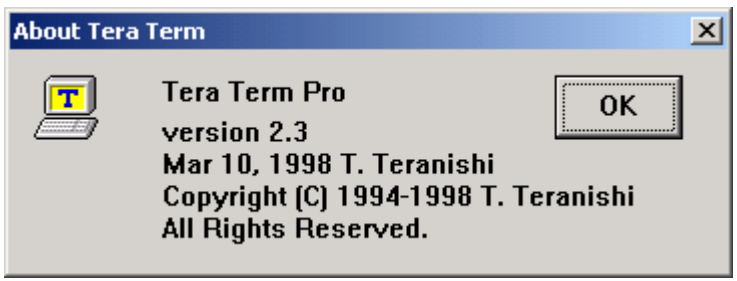
- Connect Ethernet, DVI, and a USB Keyboard to ML501

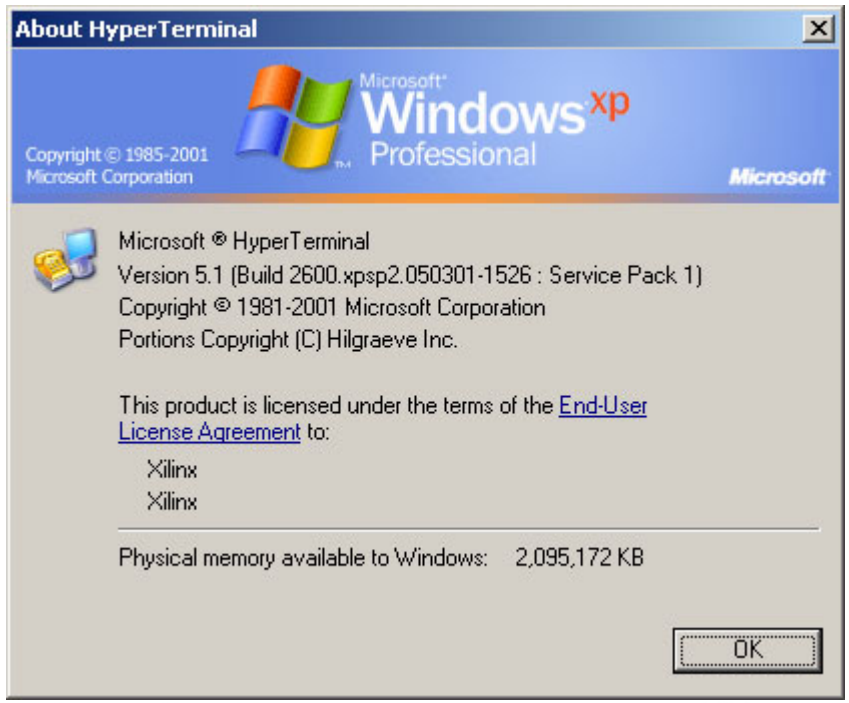


© 2007 Xilinx, Inc. All Rights Reserved

Software Setup

- Install a terminal program, such as Tera Term Pro, or use the HyperTerminal program included with Microsoft Windows
  - Required to input the commands, and view the results
- See the appendix for details on terminal programs and setup

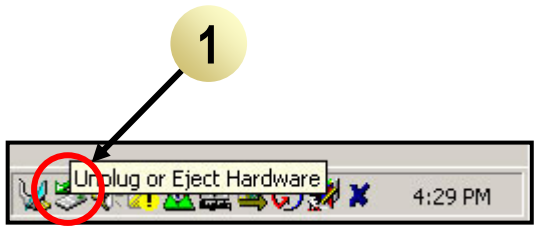


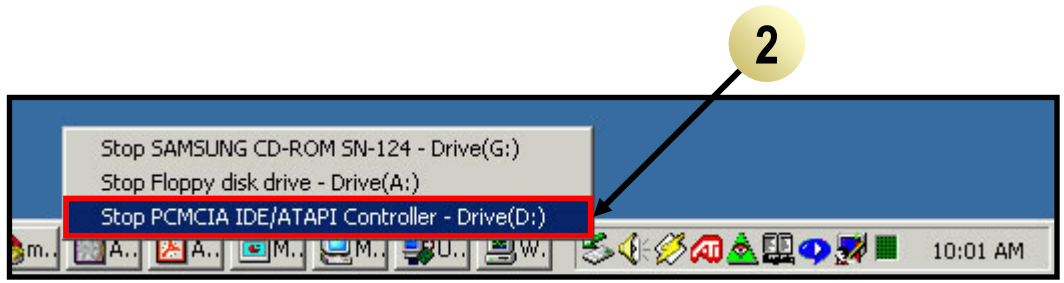


© 2007 Xilinx, Inc. All Rights Reserved

Remove the CompactFlash

- When using a PC Card Adapter, the card must be properly stopped before the it is removed from your PC
  - Click on the Unplug or Eject Hardware icon in your system tray (1)
  - Stop the PCMCIA controller (2)



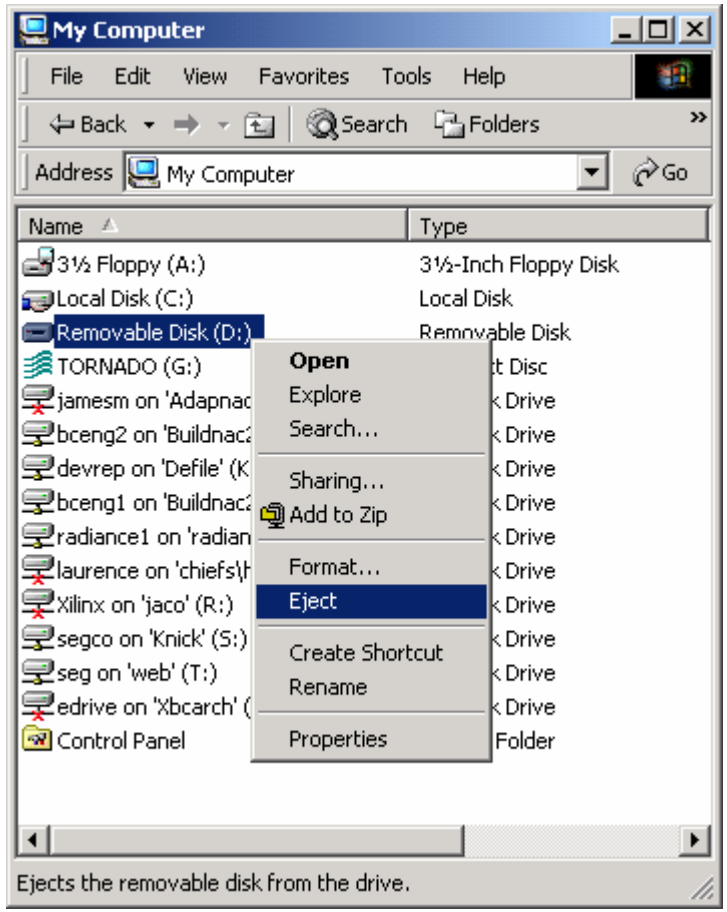


XILINX®

© 2007 Xilinx, Inc. All Rights Reserved

CompactFlash Setup

- Some devices, such as the SanDisk ImageMate, do not need to be stopped, but the CompactFlash must still be properly ejected
- Perform a software eject on the CompactFlash before removing it from the SanDisk ImageMate
  - In the My Computer window, right click on Removable Disk and select Eject to remove it from your PC
  - This insures that data will be written to it



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

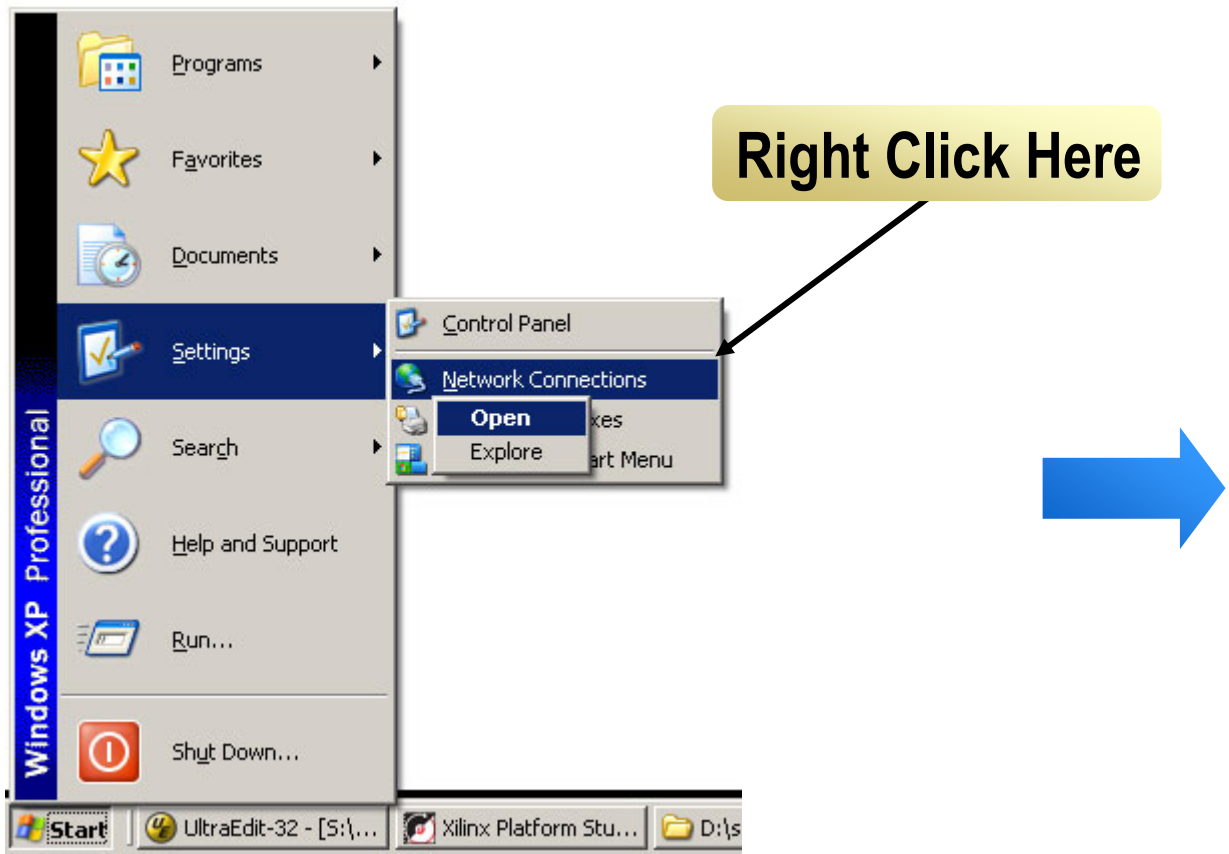
CompactFlash Setup

- Insert the CompactFlash provided with the ML501 fully into the CompactFlash slot on the ML501 board

© 2007 Xilinx, Inc. All Rights Reserved

Network Setup

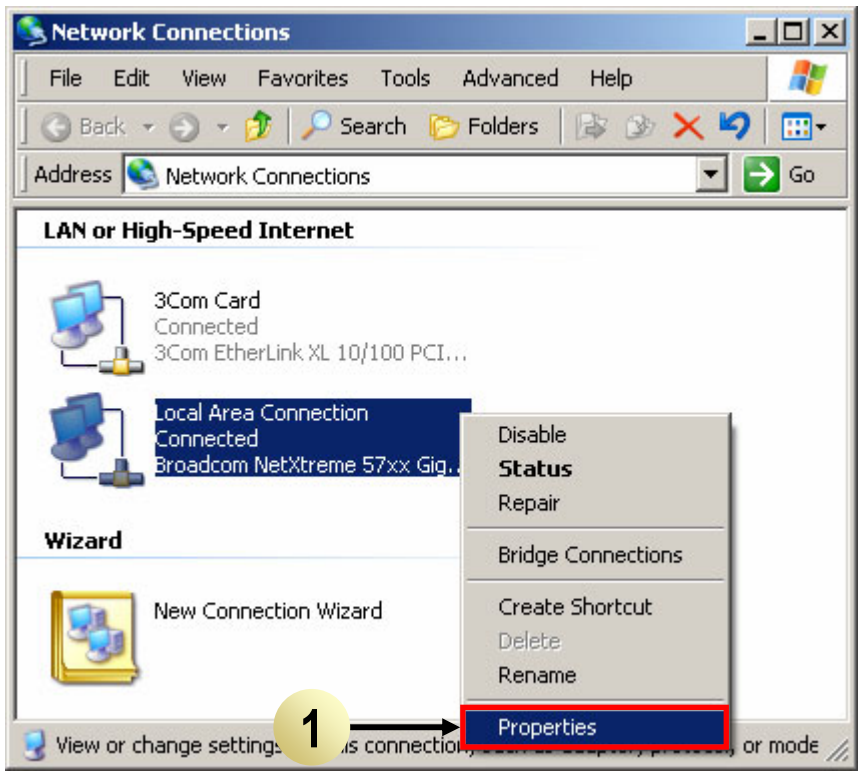
- Click Start → Settings → <*Right Click*> Network Connections → Open



© 2007 Xilinx, Inc. All Rights Reserved

Network Setup

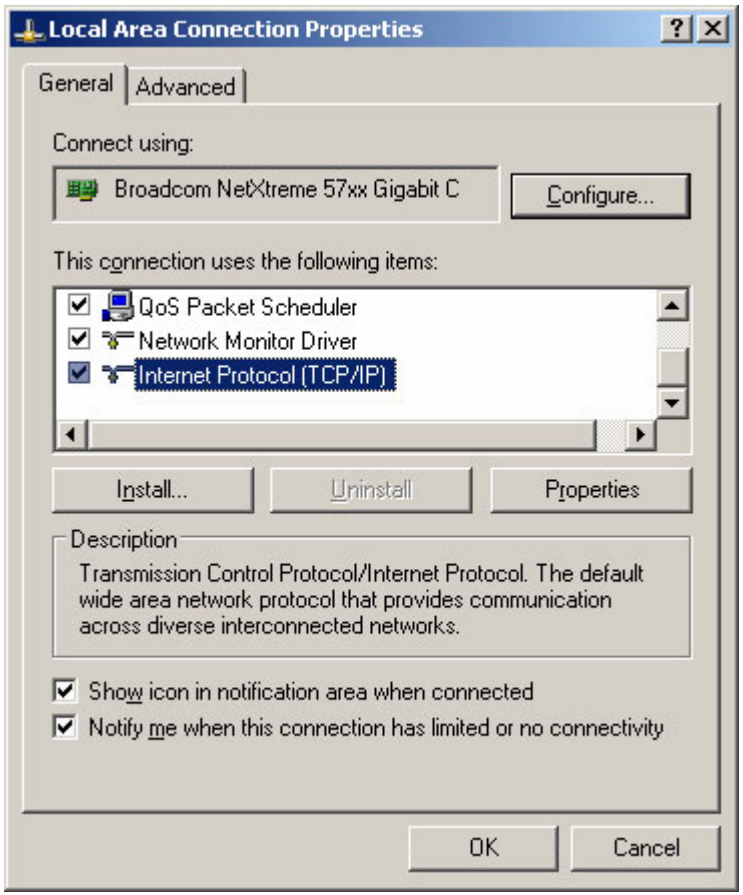
- In the Network Connections, right-click on the Ethernet Adapter and select Properties (1)

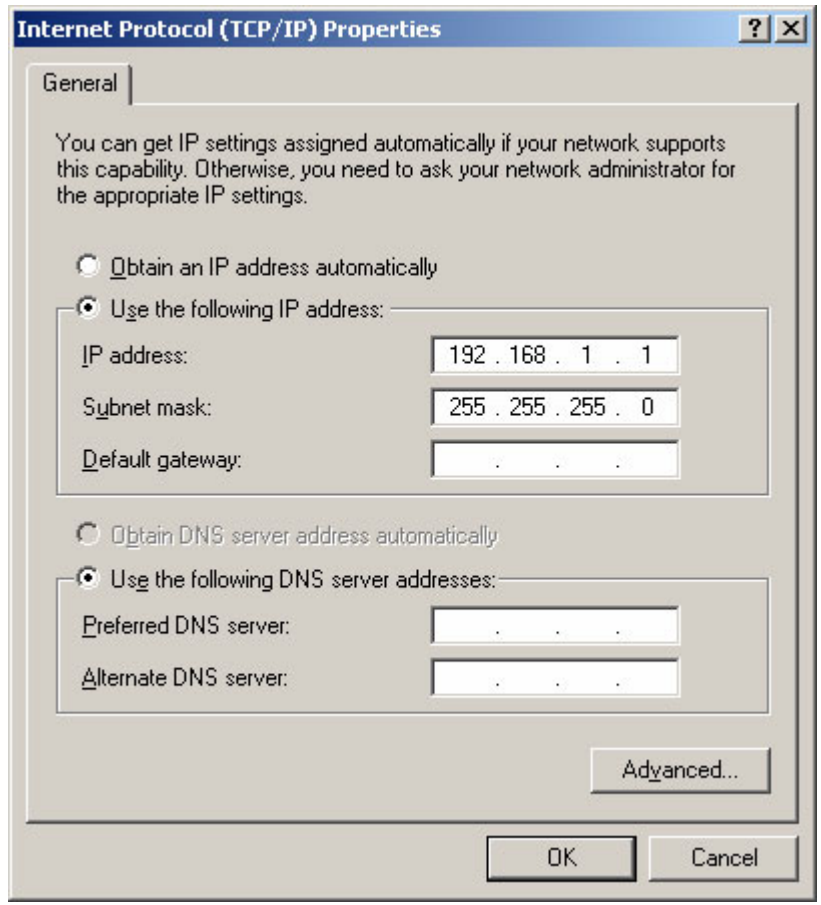


XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Network Setup

- Set your host (PC) to this IP Address:



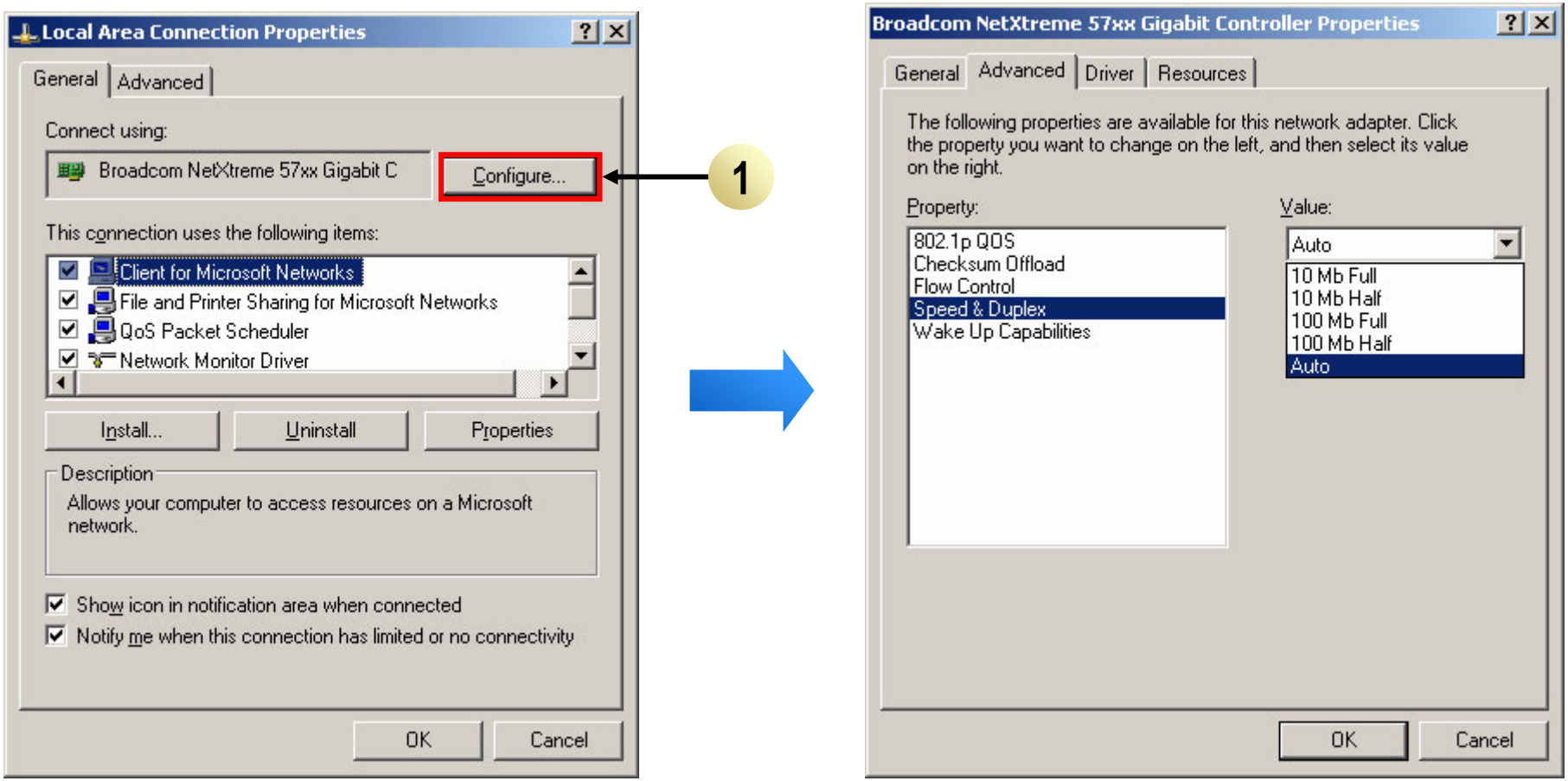

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address: 192 . 168 . 1 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Note: Some presentations use other IP addresses; change as directed

© 2007 Xilinx, Inc. All Rights Reserved

Network Setup

- Click Configure (1)
  - Set the Media Type to Auto for 1 Gbps

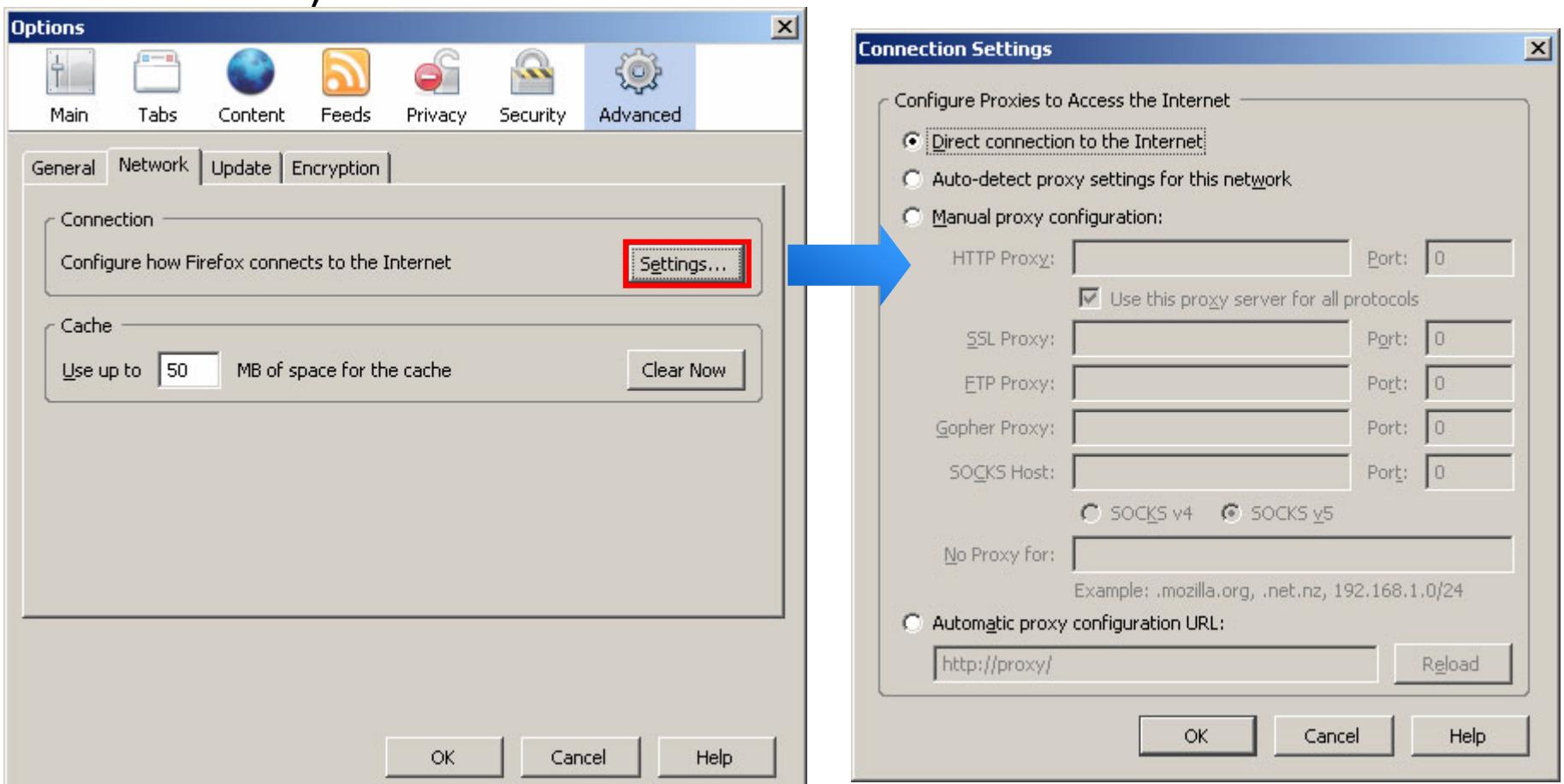


Note: ML501 QuickStart uses 100Mb Full

© 2007 Xilinx, Inc. All Rights Reserved

Browser Setup

- The lwip/webserver demo requires the browser used (Firefox shown) to have a direct connection to the internet



© 2007 Xilinx, Inc. All Rights Reserved

Appendix

- Terminal Programs
  - Tera Term
  - Hyperterminal
- Creating Desktop Shortcuts

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

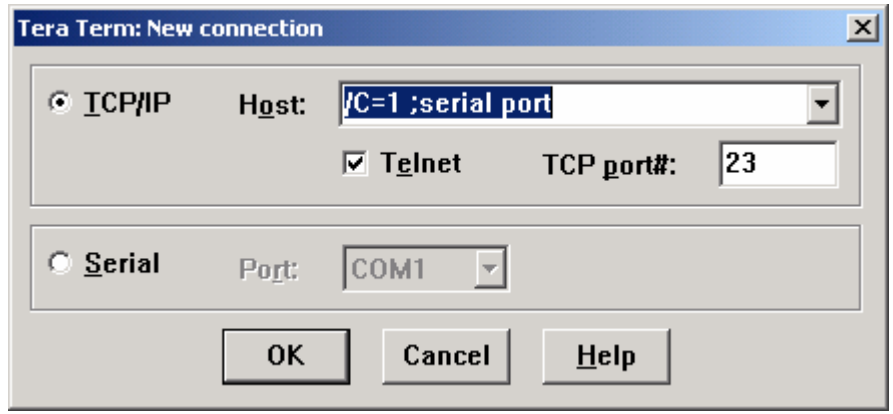
Terminal Programs

- Terminal programs are used to communicate with the processor
- Terminal programs in this setup use a serial interface
- Two free programs are available
  - Tera Term Pro (recommended)
    - **More flexible than HyperTerminal**
    - **See http://hp.vector.co.jp/authors/VA002416/teraterm.html**
  - HyperTerminal (comes with Windows)

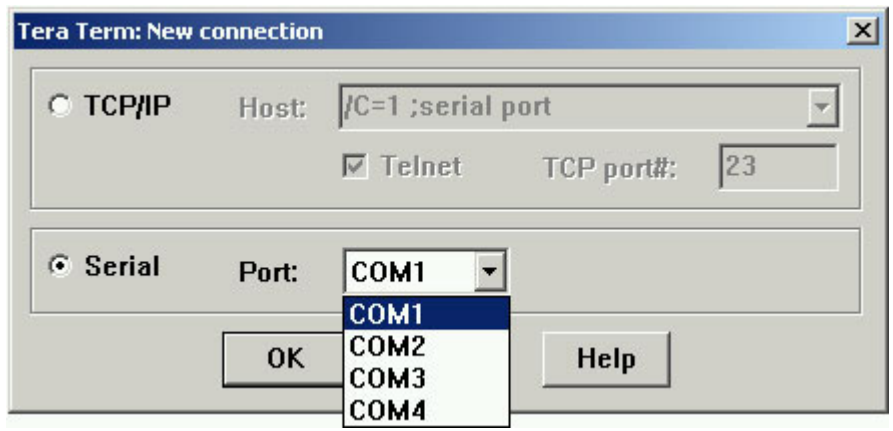
XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

- Default startup mode



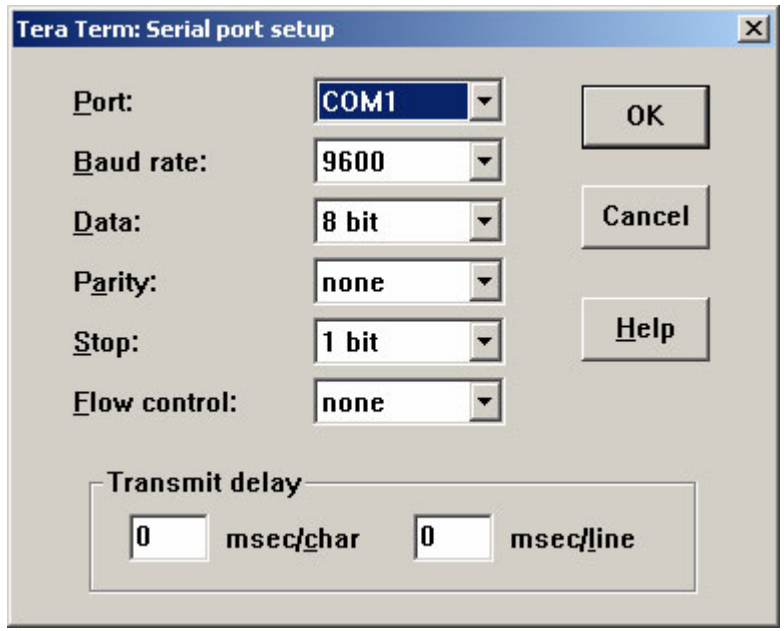
- Select the serial port that you connected your cable to



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

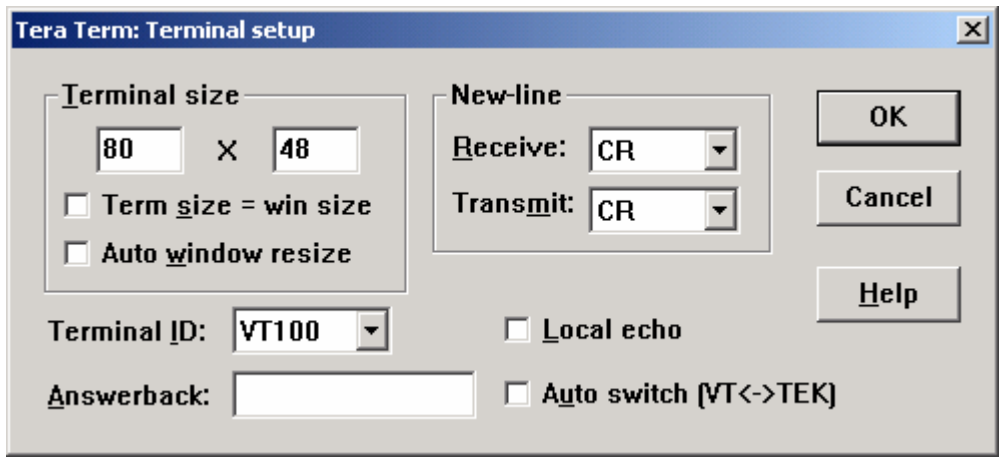
- Set the serial port parameters
  - 9600 baud
  - 8 Data Bits
  - No Parity
  - One Stop Bit
  - No Flow Control



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

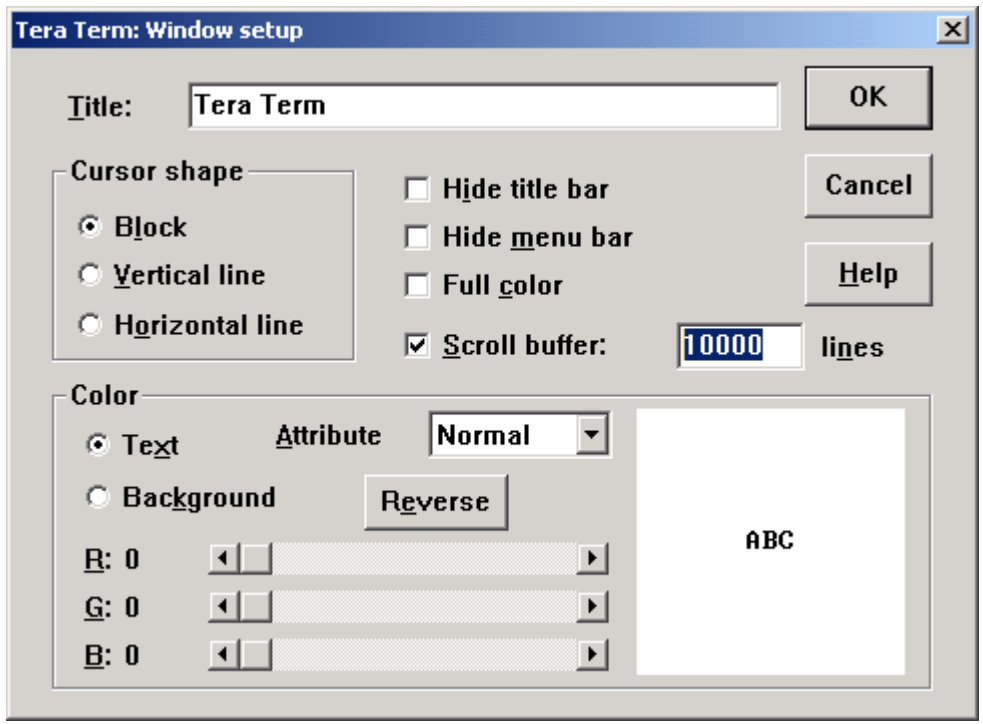
- Click Setup → Terminal… to increase the window size



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

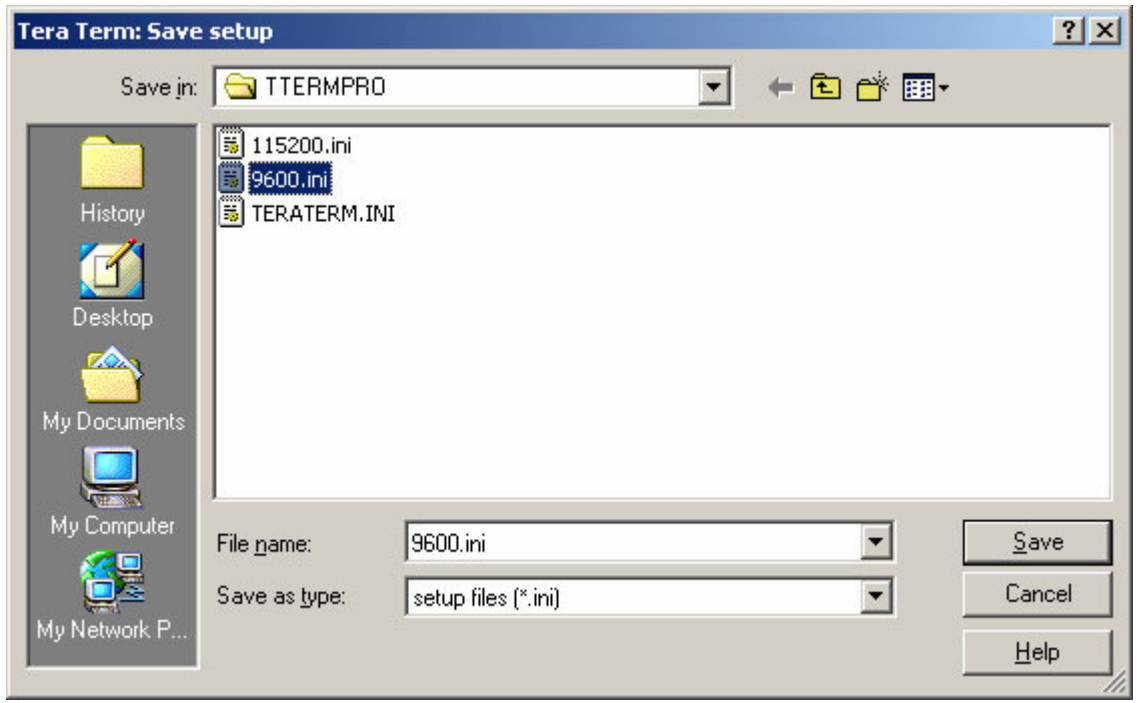
- Click Setup → Window… to increase the buffer size (to view more lines)



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

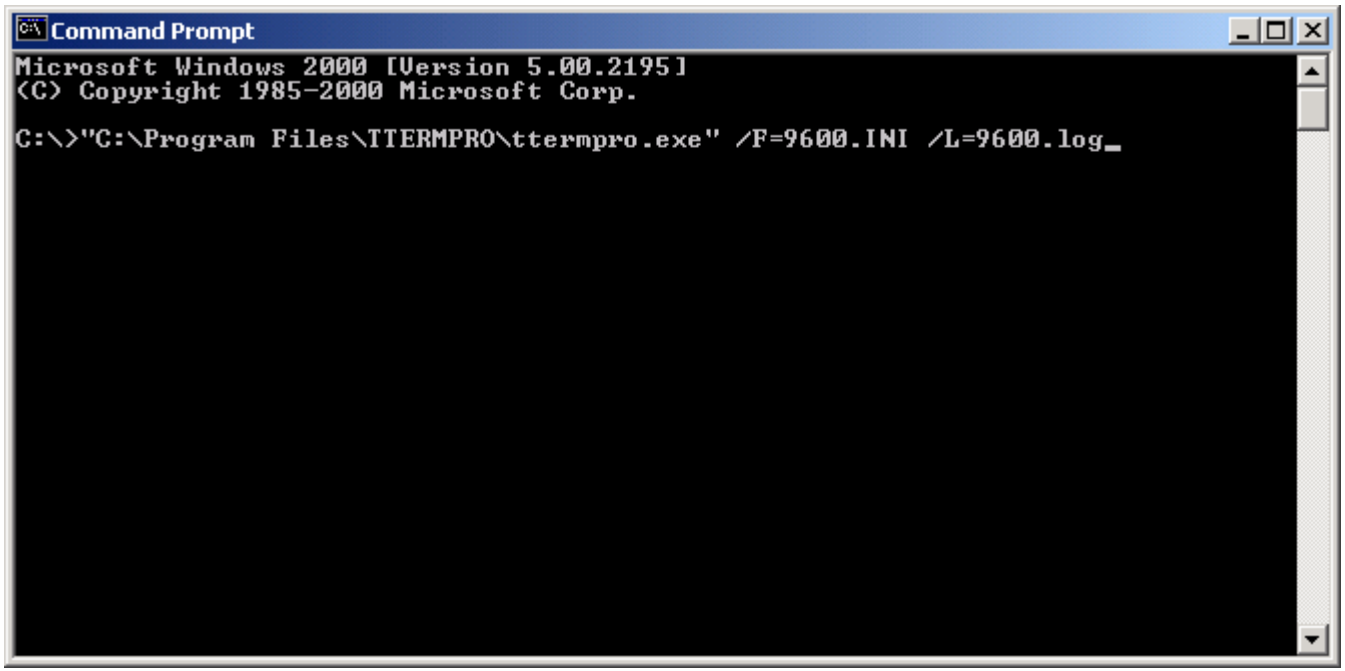
- Click Setup → Save setup… to save the terminal window setup



© 2007 Xilinx, Inc. All Rights Reserved

Tera Term Pro

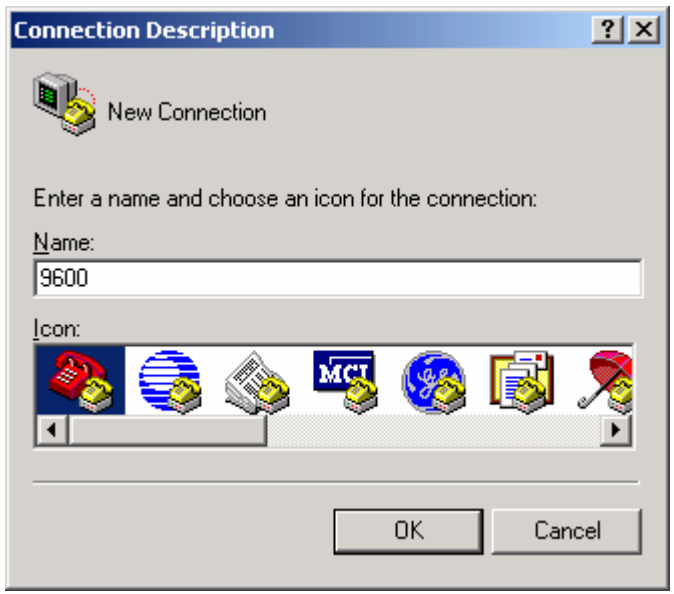
- To automatically restore the command line options
  - Use “/F=<file name>.ini”
- To automatically open a log file
  - Use “/L=<log file>.log”


Command Prompt
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.
C:\>"C:\Program Files\TTERMPRO\ttermpro.exe" /F=9600.INI /L=9600.log_

© 2007 Xilinx, Inc. All Rights Reserved

HyperTerminal

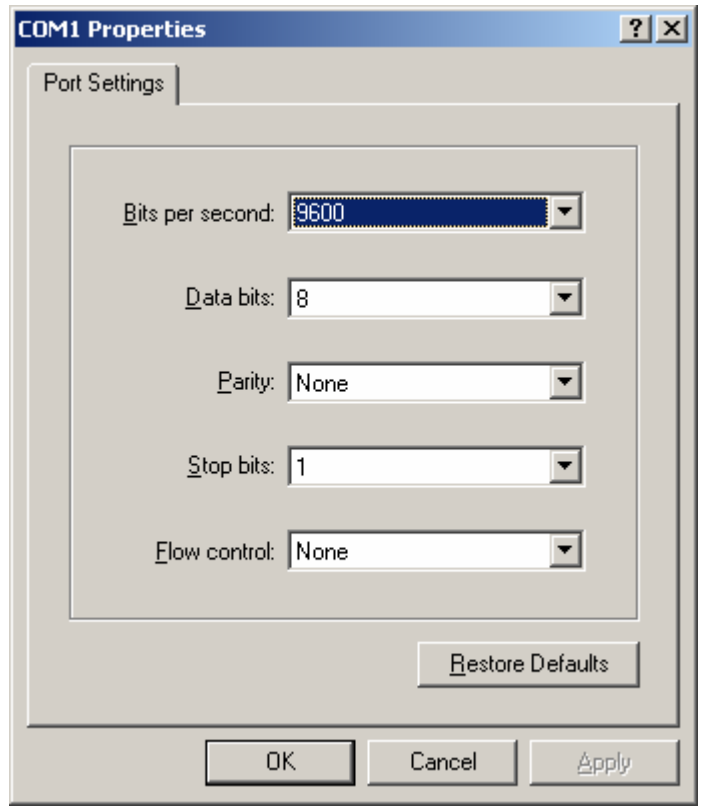
- Upon starting, you are prompted to create a new connection

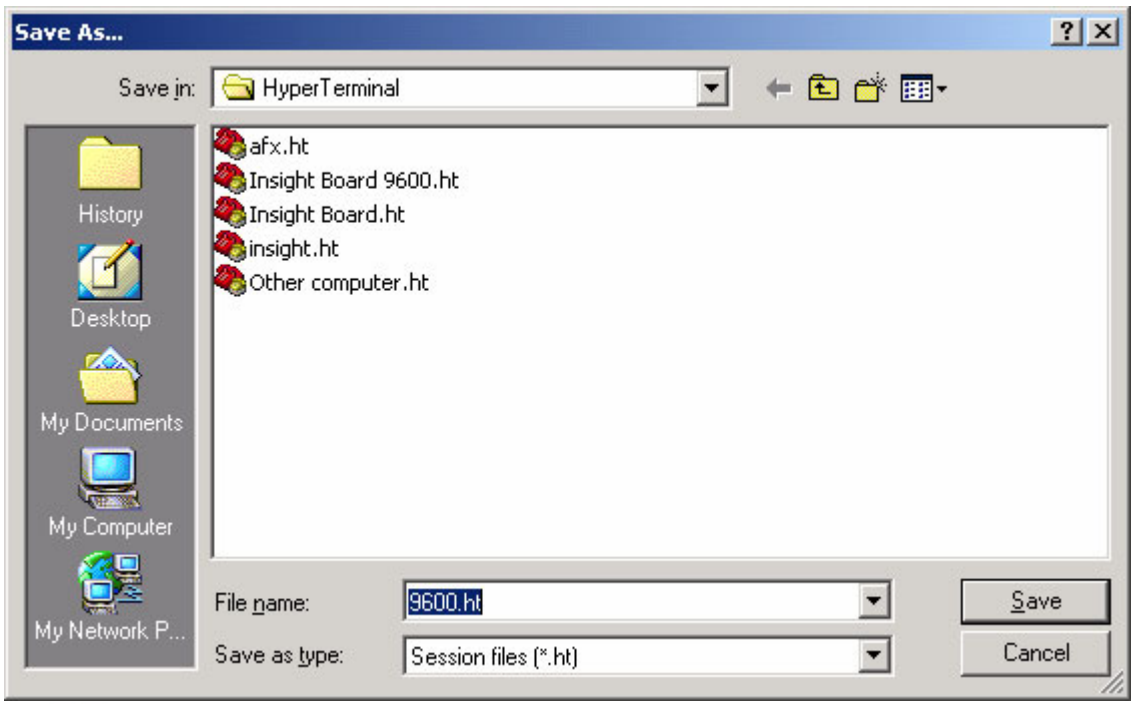


© 2007 Xilinx, Inc. All Rights Reserved

HyperTerminal

- Set the serial port parameters
  - 9600 baud
  - Same settings 8-N-1, No flow control
- Save the new connection



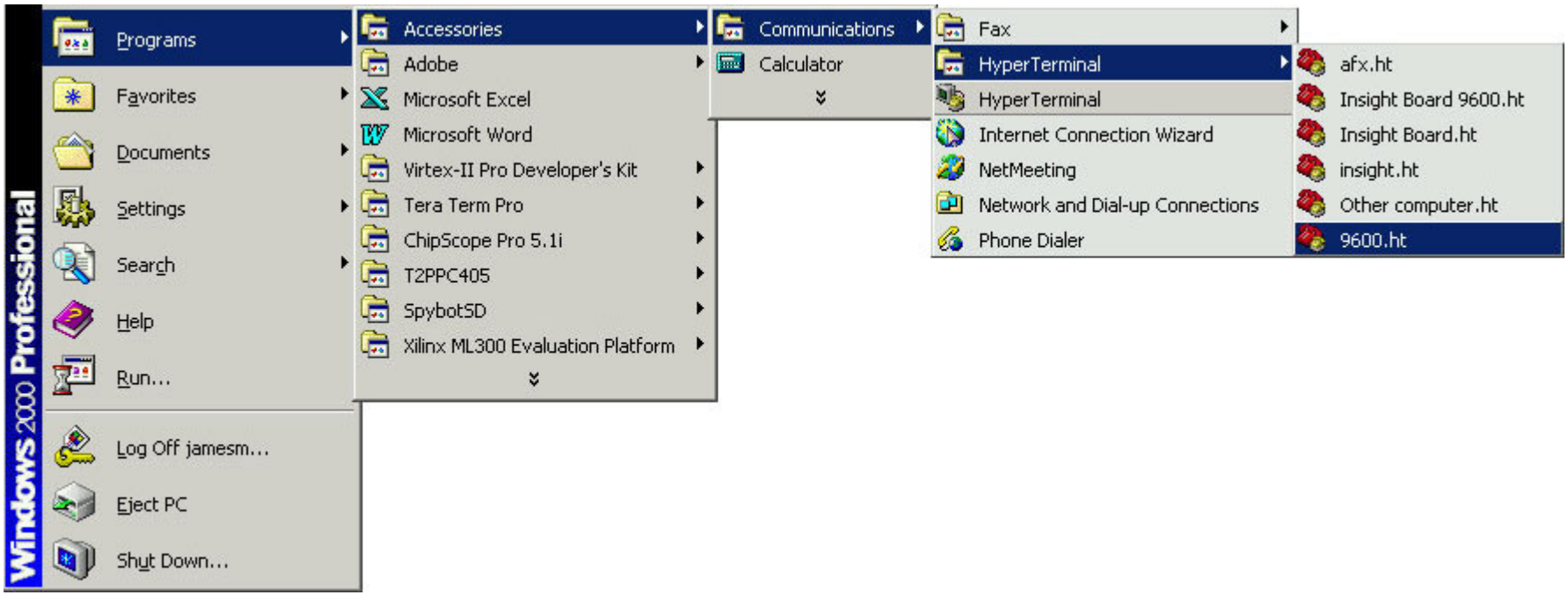


© 2007 Xilinx, Inc. All Rights Reserved

HyperTerminal

- Your new connection will appear in the start menu

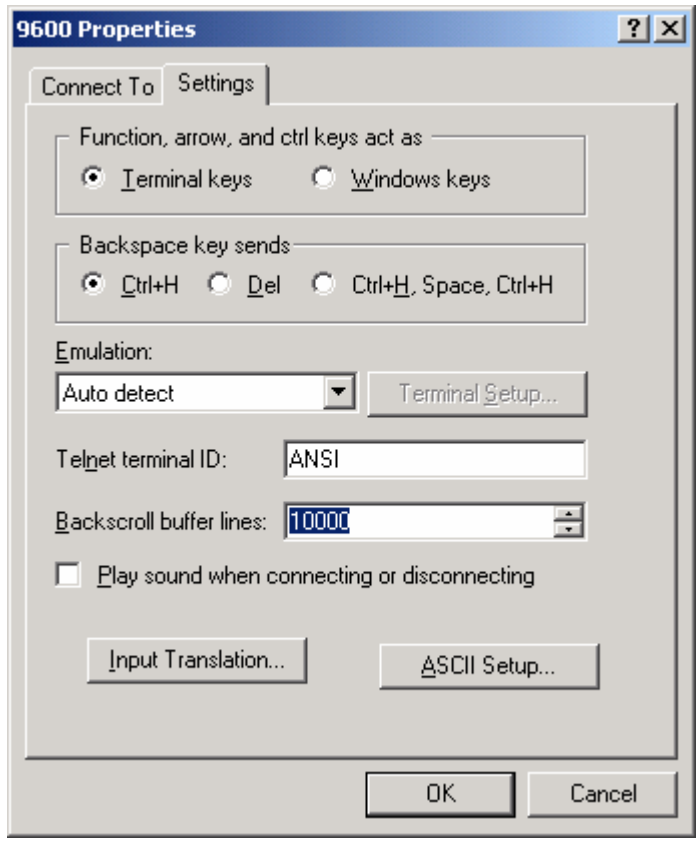
  Start → Accessories → Communications → HyperTerminal → <name>

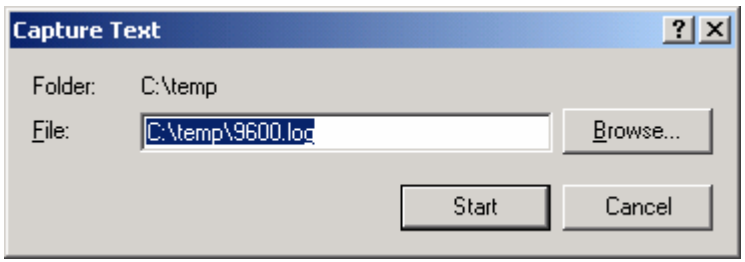


© 2007 Xilinx, Inc. All Rights Reserved

HyperTerminal

- After creating the connection, you can expand the buffer size (if desired)
  - The buffer setting must be set each time
- You can create a log file by selecting Transfer → Capture Text





© 2007 Xilinx, Inc. All Rights Reserved

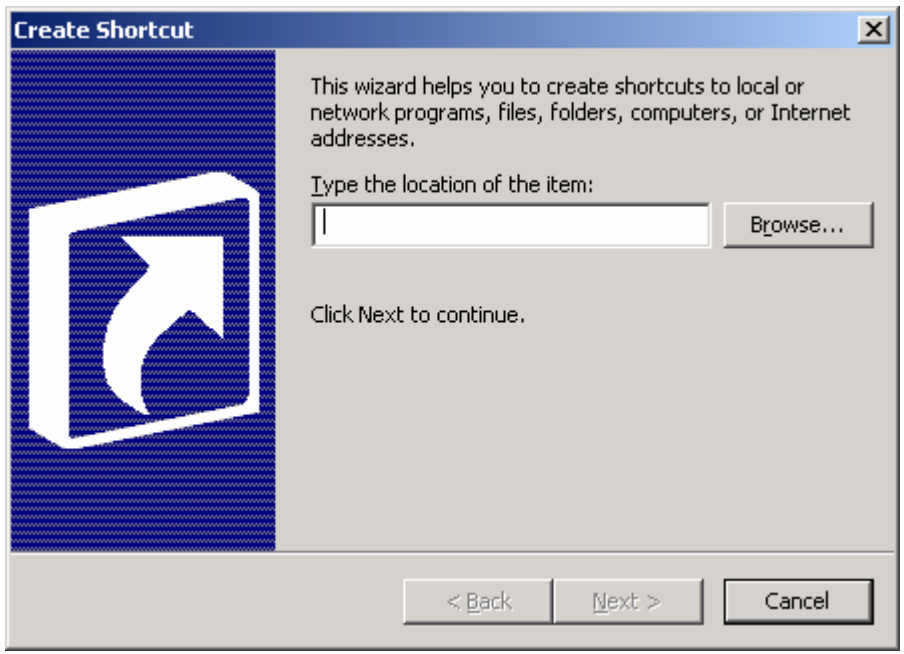
Desktop Shortcuts

- You can add shortcuts to your desktop for either Tera Term Pro or HyperTerminal
  - This works especially well for Tera Term Pro since the command line options can be added here
  - You can create different shortcuts to run the desired speed as seen below

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Desktop Shortcuts

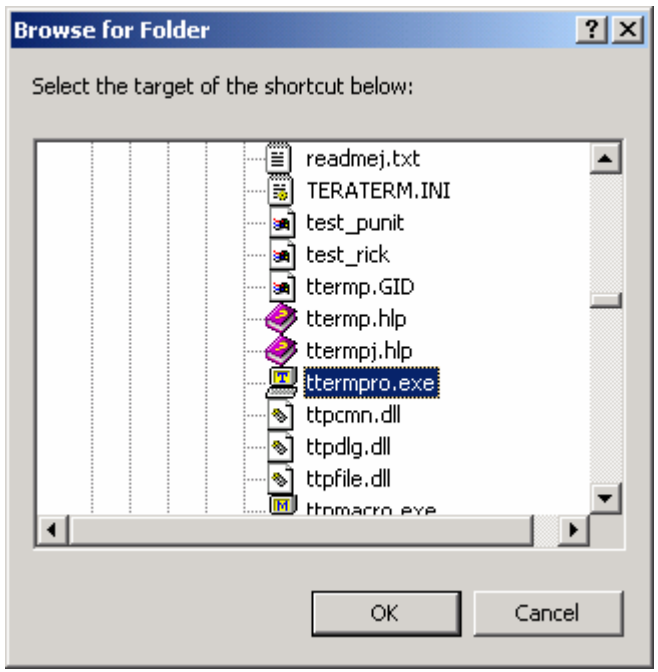
- Right-click on your desktop and select New → Shortcut
- Browse for the terminal program folder


Create Shortcut
This wizard helps you to create shortcuts to local or network programs, files, folders, computers, or Internet addresses.
Type the location of the item:
Browse...
Click Next to continue.
< Back
Next >
Cancel

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Desktop Shortcuts

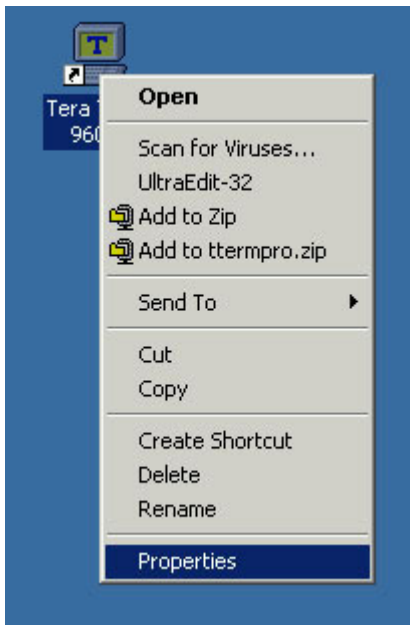
- For Tera Term Pro, link to the ttermpro.exe program file: C:\Program Files\TTERMPRO\ttermpro.exe

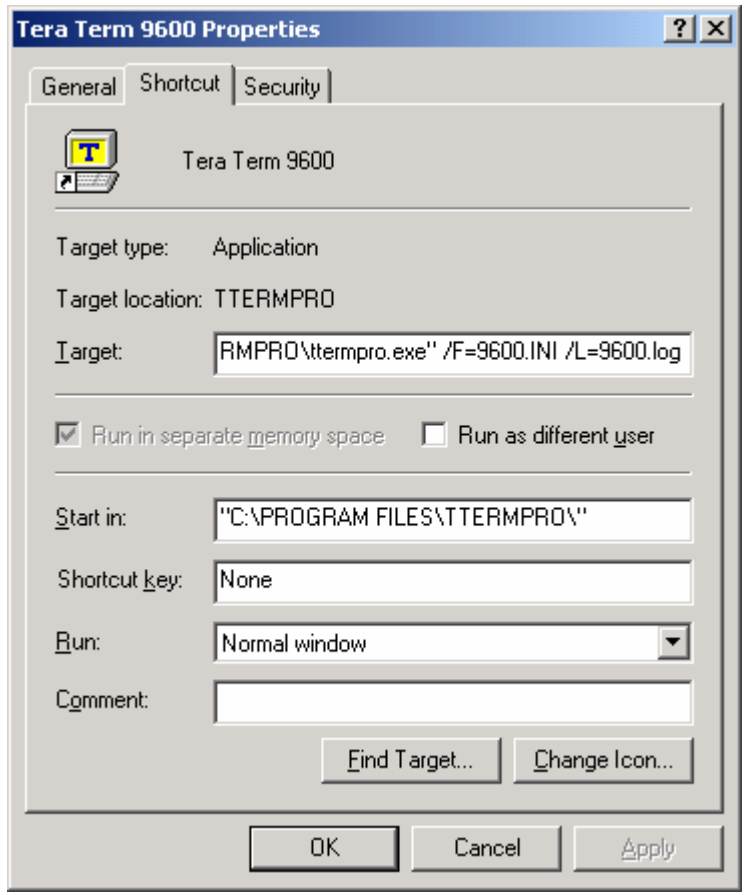


XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Desktop Shortcuts

- Name the Tera Term Pro shortcut
- Add the command line options
- Click OK

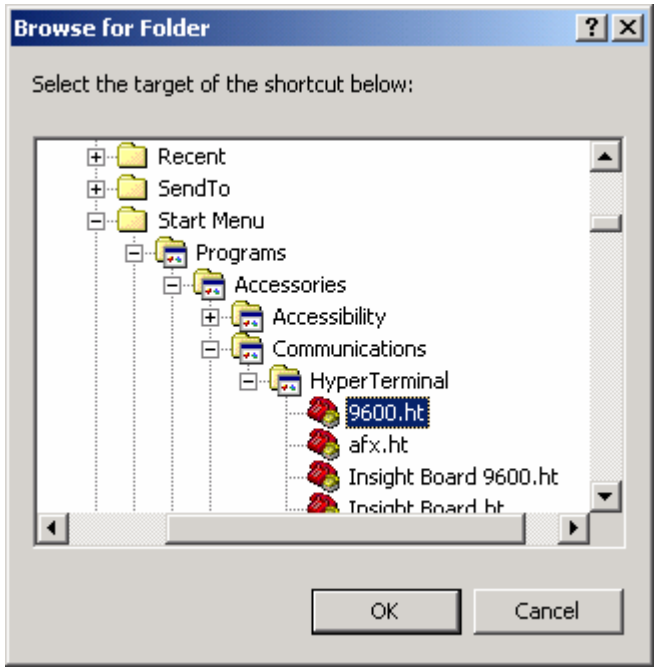




© 2007 Xilinx, Inc. All Rights Reserved

Desktop Shortcuts

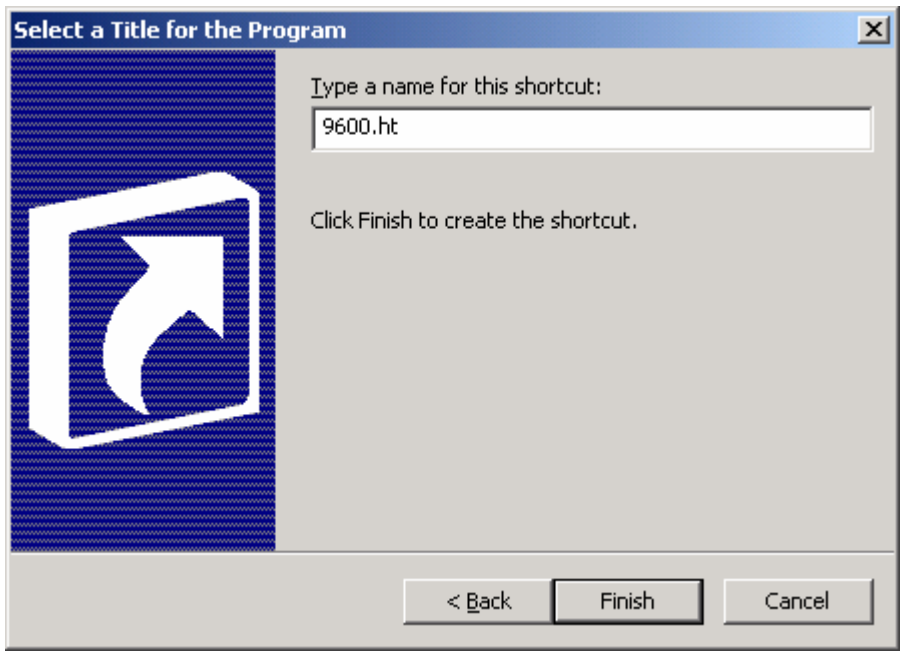
- For HyperTerminal, locate the .ht files
  C:\Documents and Settings\<user name>\Start Menu\Programs
  \Accessories\Communications\HyperTerminal



XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Desktop Shortcuts

- Name the HyperTerminal shortcut
- Click Finish
  - There are no command line options



© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Virtex-5
  - Silicon Devices
    http://www.xilinx.com/products/silicon_solutions
  - Virtex-5 Multi-Platform FPGA
    http://www.xilinx.com/products/silicon_solutions/fpgas/virtex/virtex5
  - Virtex-5 Family Overview: LX, LXT, SXT, and FXT Platforms
    http://www.xilinx.com/support/documentation/data_sheets/ds100.pdf
  - Virtex-5 FPGA DC and Switching Characteristics Data Sheet
    http://www.xilinx.com/support/documentation/data_sheets/ds202.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Virtex-5
  - Virtex-5 FPGA User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug190.pdf
  - Virtex-5 FPGA Configuration User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug191.pdf
  - Virtex-5 System Monitor User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug192.pdf
  - Virtex-5 Packaging and Pinout Specification
    http://www.xilinx.com/support/documentation/user_guides/ug195.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Design Resources
  - ISE Development Tools and IP
    http://www.xilinx.com/ise
  - Integrated Software Environment (ISE) Foundation Resources
    http://www.xilinx.com/ise/logic_design_prod/foundation.htm
  - ISE Manuals
    http://www.xilinx.com/support/software_manuals.htm
  - ISE Development System Reference Guide
    http://toolbox.xilinx.com/docsan/xilinx10/books/docs/dev/dev.pdf
  - ISE Development System Libraries Guide
    http://toolbox.xilinx.com/docsan/xilinx10/books/docs/virtex5_hdl/virtex5_hdl.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Additional Design Resources
  - Customer Support
    http://www.xilinx.com/support
  - Xilinx Design Services:
    http://www.xilinx.com/xds
  - Titanium Dedicated Engineering:
    http://www.xilinx.com/titanium
  - Education Services:
    http://www.xilinx.com/education
  - Xilinx On Board (Board and kit locator):
    http://www.xilinx.com/xob

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Platform Studio
  - Embedded Development Kit (EDK) Resources
    http://www.xilinx.com/edk
  - Embedded System Tools Reference Manual
    http://www.xilinx.com/support/documentation/sw_manuals/edk10_est_rm.pdf
  - EDK Concepts, Tools, and Techniques
    http://www.xilinx.com/ise/embedded/edk92i_docs/edk_ctt.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- MicroBlaze
  - MicroBlaze Processor
    http://www.xilinx.com/microblaze
  - MicroBlaze Processor Reference Guide – UG081
    http://www.xilinx.com/support/documentation/sw_manuals/mb_ref_guide.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- ChipScope Pro
  - ChipScope Pro 10.1i Serial IO Toolkit User Manual
    http://www.xilinx.com/ise/verification/chipscope_pro_siotk_10_1_ug213.pdf
  - ChipScope Pro 10.1i ChipScope Pro Software and Cores User Guide
    http://www.xilinx.com/ise/verification/chipscope_pro_sw_cores_10_1_ug029.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Memory Solutions
  - Demos on Demand – Memory Interface Solutions with Xilinx FPGAs
    http://www.demosondemand.com/clients/xilinx/001/page_new2/index.asp#35
  - Xilinx Memory Corner
    http://www.xilinx.com/products/design_resources/mem_corner
  - Additional Memory Resources
    http://www.xilinx.com/support/software/memory/protected/index.htm
  - Xilinx Memory Interface Generator (MIG) 2.1 User Guide
    http://www.xilinx.com/support/software/memory/protected/ug086.pdf
  - Memory Interfaces Made Easy with Xilinx FPGAs and the Memory Interface Generator
    http://www.xilinx.com/support/documentation/white_papers/wp260.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- Ethernet
  - Virtex-5 Embedded Tri-Mode Ethernet MAC Wrapper Data Sheet
    http://www.xilinx.com/support/documentation/ip_documentation/v5_emac_ds550.pdf
  - Virtex-5 Embedded Tri-Mode Ethernet MAC Wrapper Getting Started Guide
    http://www.xilinx.com/support/documentation/ip_documentation/v5_emac_gsg340.pdf
  - Virtex-5 Tri-Mode Ethernet Media Access Controller User Guide
    http://www.xilinx.com/support/documentation/user_guides/ug194.pdf
  - LightWeight IP (lwIP) Application Examples – XAPP1026
    http://www.xilinx.com/support/documentation/application_notes/xapp1026.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- PLB v4.6 IP
  - Processor Local Bus (PLB) v4.6 Data Sheet – DS531
    http://www.xilinx.com/support/documentation/ip_documentation/plb_v46.pdf
  - Multi-Port Memory Controller (MPMC) – DS643
    http://www.xilinx.com/support/documentation/ip_documentation/mpmc.pdf
  - XPS Multi-CHannel External Memory Controller (XPS MCH EMC) – DS575
    http://www.xilinx.com/support/documentation/ip_documentation/xps_mch_emc.pdf
  - XPS LocalLink TEMAC – DS537
    http://www.xilinx.com/support/documentation/ip_documentation/xps_ll_temac.pdf
  - XPS LocalLink FIFO – DS568
    http://www.xilinx.com/support/documentation/ip_documentation/xps_ll_fifo.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- PLB v4.6 IP
  - XPS IIC Bus Interface – DS606
    http://www.xilinx.com/support/documentation/ip_documentation/xps_iic.pdf
  - XPS SYSACE (System ACE) Interface Controller – DS583
    http://www.xilinx.com/support/documentation/ip_documentation/xps_sysace.pdf
  - XPS Timer/Counter – DS573
    http://www.xilinx.com/support/documentation/ip_documentation/xps_timer.pdf
  - XPS Interrupt Controller – DS572
    http://www.xilinx.com/support/documentation/ip_documentation/xps_intc.pdf
  - Using and Creating Interrupt-Based Systems Application Note
    http://www.xilinx.com/support/documentation/application_notes/xapp778.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- PLB v4.6 IP
  - XPS General Purpose Input/Output (GPIO) – DS569
    http://www.xilinx.com/support/documentation/ip_documentation/xps_gpio.pdf
  - XPS External Peripheral Controller (EPC) – DS581
    http://www.xilinx.com/support/documentation/ip_documentation/xps_epc.pdf
  - XPS 16550 UART – DS577
    http://www.xilinx.com/support/documentation/ip_documentation/xps_uart16550.pdf
  - PLBV46 to DCR Bridge Data Sheet – DS578
    http://www.xilinx.com/support/documentation/ip_documentation/plbv46_dcr_bridge.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- IP
  - Local Memory Bus Data Sheet – DS445
    http://www.xilinx.com/support/documentation/ip_documentation/lmb_v10.pdf
  - Block RAM Block Data Sheet – DS444
    http://www.xilinx.com/support/documentation/ip_documentation/bram_block.pdf
  - Microprocessor Debug Module Data Sheet – DS641
    http://www.xilinx.com/support/documentation/ip_documentation/mdm.pdf
  - LMB Block RAM Interface Controller Data Sheet – DS452
    http://www.xilinx.com/support/documentation/ip_documentation/lmb_bram_if_cntlr.pdf
  - Device Control Register Bus (DCR) v2.9 Data Sheet – DS406
    http://www.xilinx.com/support/documentation/ip_documentation/dcr_v29.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- IP
  - JTAGPPC Controller Data Sheet – DS298
    http://www.xilinx.com/support/documentation/ip_documentation/jtagppc_cntlr.pdf
  - Processor System Reset Module Data Sheet – DS402
    http://www.xilinx.com/support/documentation/ip_documentation/proc_sys_reset.pdf
  - Clock Generator v2.0 Data Sheet – DS614
    http://www.xilinx.com/support/documentation/ip_documentation/clock_generator.pdf
  - Util Bus Split Operation Data Sheet – DS484
    http://www.xilinx.com/support/documentation/ip_documentation/util_bus_split.pdf

XILINX®
© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- ML501
  - ML501 Overview
    http://www.xilinx.com/ml501
  - ML501 Evaluation Platform User Guide – UG226
    http://www.xilinx.com/support/documentation/boards_and_kits/ug226.pdf
  - ML501 Reference Design User Guide – UG227
    http://www.xilinx.com/support/documentation/boards_and_kits/ug227.pdf
  - ML501 Getting Started Tutorial – UG228
    http://www.xilinx.com/support/documentation/boards_and_kits/ug228.pdf

© 2007 Xilinx, Inc. All Rights Reserved

Documentation

- ML501
  - ML501 Schematics

    http://www.xilinx.com/support/documentation/boards_and_kits/ml501_20061010_bw.pdf
  - ML501 Bill of Material

    http://www.xilinx.com/support/documentation/boards_and_kits/ml505_501_bom.xls

© 2007 Xilinx, Inc. All Rights Reserved